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SCIENCE

NEW SERIES
VOL. XLVIII No. 1251

FRIDAY, DECEMBER 20, 1918

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1914-1918

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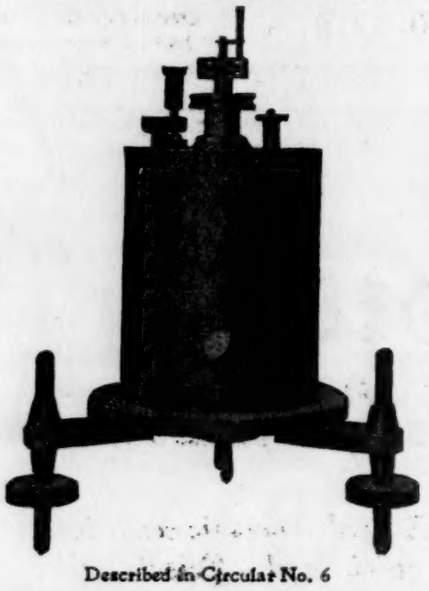

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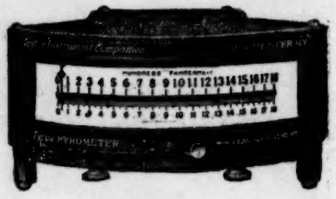

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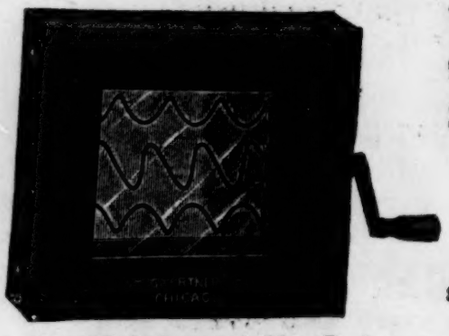

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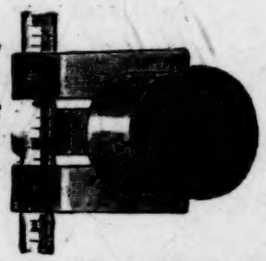

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FRIDAY, DECEMBER 20, 1918

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NATIONAL PRESTIGE IN SCIENTIFIC ACHIEVEMENT[1]

IN our development and application of scientific principles, the intensive factor of publicity is by no means to be ignored. It may be magnanimous to give others full credit for what they have done and to belittle our own achievements, but it is hardly fair to the nation as a whole so long as public opinion continues to be so strongly influenced by publicity. We are familiar with the prestige in pure and applied science enjoyed by Germany prior to the war and many of us are familiar with her methods, some of them entirely legitimate by every standard, others entirely indefensible by any standard. We envied Germany her diligent, productive scientists, smiled at her many false claims to superiority and originality, contributed rather freely to German scientific literature, with some qualms of conscience and pretty generally despised German technologists for their piratical methods. "How do they ever get away with it?" we asked ourselves and let it go at that. It never occurred to many of us to assert our scientific independence as a matter of national duty and Germany was rapidly attaining the leadership she craved. In penance we now burn our German books and studiously avoid reading anything in that language. We are surprised to find how well we can get along without anything in that language and for how little we are really indebted to that nation.

Still it is well worth while to trace out the underlying principles and to apply them to the enhancement of our national welfare. In her

[1] Since this article was prepared (in September) there has appeared in SCIENCE a letter by Professor E. B. Wilson on "Insidious Scientific Control." It appears highly desirable to give this matter immediate and careful consideration to the end that our technical and scientific societies may take effective action in the near future.

good, bad and indifferent activities, Germany attracted a great deal of attention and we are fortunate in having for study a case so well developed and (now) so well understood.

It can not be claimed that scientific ability per capita was higher in native-born Teutons than among other civilized races, yet it is doubtless true that the scientific and technical output was greater in proportion to population in Germany than in any other country and that the prestige she attained in science, technology and in her industries was truly remarkable. In this discrepancy between native ability, achievement and reputation lies the key to the whole problem of securing national prestige in achievement.

More than that of any other nationality perhaps, the Teuton mind had the faculty of intensive application. A specific problem occupies it to the exclusion of almost everything else. While we are prone to work a few hours, then turn to something else or run off to play, the Teuton eats and sleeps with his problem, takes little interest in anything else, talks shop with his colleagues and does not completely relax even in his limited recreation. Our own most eminent scientists, although by no means our most richly endowed, are men who have continued in one line of work year after year and who carry a group of problems with them everywhere.

We Americans are as ready as any to see and to attack difficult and important scientific problems. Nor do we lack the incentive and application necessary to obtain results. What we do lack is the "follow through" to thoroughly search out and master a problem in all its details, generalities and side issues before turning our attention to new problems. To minds teeming with ideas all clamoring for attention, it is not easy to ignore the many that a few may receive fuller attention. However it is obviously necessary to correct this tendency to scattered effort if we are to attain our full measure of national prestige.

The Teutons were further the most prolific writers of scientific and technical literature in recent years. Our libraries were filled with their journals and reference books, and, being available in such profusion, our chemists and physicists constantly consulted them and grew to regard them as authoritative and indispensable. From our own point of view, printing was simply less expensive in Germany, new journals were easily started and books were readily accepted for publication on a narrow margin of profit. Many a struggling scientist eked out a meager salary by compiling and writing reference books when such would not be attempted in this country by men of equal ability. Our publishers require a far greater margin and our experts are too busy to do much writing. Our few good journals are crowded with material for publication months in advance. However distasteful it may be, publish we must if we are to be regarded as leaders.

Alien students, university professors and technical men working in Germany have added greatly in building up her scientific prestige. These aliens in Germany represented fully ten per cent. in each class—clear "velvet" to her and a corresponding loss to their own countries. The alien students came in about equal numbers from Russia, England and the United States with a scattered representation from Scandinavia, Switzerland and Japan but there were hardly any French or other Latins. No special inducements were offered alien students but matriculation was easy while fees and living expenses were very moderate—hardly half those at Cambridge or Oxford. The instruction itself was hardly worth any special effort but it was accessible and it differed from the home product. This country has drawn quite a number of students of engineering and science from Latin America, Japan and China with a few from Russia, Germany and Holland, but with inflexible entrance requirements and moderately high living expenses, alien attendance at our universities has not been large.

German universities drew freely upon foreign countries for their instructors. Their budget system is extremely flexible compared with ours and they drew men freely from Russia,

Holland and Switzerland. It is said that Nernst found Einstein living in a garret in Switzerland and had little difficulty in engaging him for the University of Berlin. It has been estimated that a third of the more noted German scientists were foreign born. Nearly all of these aliens soon become Teutonized and were thereafter regarded as German. No small fraction of the prestige enjoyed by German universities was due to imported talent and to that of the Jews who were treated almost as aliens. The faculties of our universities are undoubtedly too immobile. A freer transfer of instructors from one university to another and from foreign universities to our own will undoubtedly lead to better instruction in them and enhanced prestige for them.

Technical men of ability of all nationalities found in Germany a welcome and a rich field of endeavor. Facilities for working out processes were good and capital for developing manufacturing possibilities not difficult to obtain. A large fraction of the better known German manufactures originated in France, Italy, England or America, the inventor having gone to Germany to secure the opportunity for development not available at home or foreign process having been adopted and developed. We have neither the cheap capital nor the cheap labor in this country but we have the raw material, cheap power and the market, with unequaled opportunities for industrial research in a wide variety of lines of manufacture. What we most need perhaps is a more perfect mobilization of our industrial resources to the end that fewer industrial prospects of value are left unworked. With such we should be able, with improved processes and machinery to compete with cheaper capital or labor anywhere in almost any line of manufacture.

So much for those factors in Germany's scientific and technical prestige more or less worthy of our consideration. There have been many other factors which we need only know to guard against. Plagiarism and piracy were common practises, and from personal knowledge I doubt whether a third of even the more eminent German scientists were free from this taint. Further, work of foreigners was taught as the work of Germans in both literature and science. Neither fairy tale nor scientific discovery, if in an obscure publication, was safe from adoption as their own while the misleading of the young student was easy and common. Our own faults are quite the reverse of these. If anything, in our own work we pay too little regard to the work of others and in our teaching we are rather inclined to magnify the work of foreigners and disparage our own.

In short Germany's scientific and industrial prestige was due chiefly to a better mobilization of forces; freer publication, better opportunities for research, to ideas and talent imported from other countries and plenty of push and pride in achievement. What we need in America is a better mobilization all along the line. We possess plenty of talent, as a rule not well directed nor given much encouragement. We have plenty of universities and industrial research laboratories of the highest grade, operating as uncoordinated individual units with very little team work to achieve large ends. We have many strong scientific and technical organizations each holding regular meetings and supporting one or more journals. These organizations, like our universities, are strongly individualistic and exhibit very little team work or cooperation to achieve broad purposes. Science is only just beginning to be popular in our schools and in the public press; we need to advertise and popularize not only scientific and technical work, but especially deep broad fundamental principles in every line of effort. Finally and most important of all we need vastly increased effort in living up to our possibilities. In habitual effort the Teutons excelled us by at least 30 per cent. and at least equalized their deficiency in originality. We might easily double our stress of achievement without detriment to ourselves.

For some of these problems in securing our prestige and independence through achievement, we have no solutions to offer; for others

the solutions are obvious. Our government has already made a tremendous stride in the promotion of national welfare by drafting our young men and sending them to colleges and universities for their higher mental, physical and moral training. If continued, this policy should yield a plentiful supply of well selected material for our higher scientific, professional, technical and administrative positions, imbued with proper habits and principles.

In the mobilization of our man power already developed, much could be accomplished by our great engineering and scientific societies if but given a freer hand in directing affairs affecting national welfare and in working our broad fundamental problems. They are already providing fairly well for the development and publication of scientific and technical literature and could undoubtedly take care of this and of the writing and publication of reference books. Many very valuable pieces of work have been done by individuals and committees for their organizations which would never have been undertaken by the individual alone. The societies mentioned stand between our great educational institutions and the national welfare which is the objective of higher education and it is very gratifying that they are gaining in influence in both.

The popularizing of organized knowledge and fundamental truths and vital principles of all kinds lies with our individuals of accomplishment and refined judgment. Let these be given every possible encouragement and inducement to pass on their knowledge to those less favored and less advanced.

Finally the increase of our total output all along the line through greater incentives to achievement can only come from the habitual emphasizing of those factors in productive achievement which every individual recognizes in himself. Whenever the question of whether to undertake or not to undertake arises, let us put ourselves under contract to produce certain results. To many of us the strife to increase our income or to secure the praise and respect of others are powerful factors. If we live up to but fifty per cent. of our possibilities we shall at least double our effective output and as a nation, state or individual command the respect of others.

P. G. Nutting

THE CRITERIA IN THE DECLARATION OF CHEMICAL INDEPENDENCE IN THE UNITED STATES[1]

The funds and knowledge and experience of every branch of scientific activity, every ounce of our strength and every grain of our intelligence have been drawn upon in the defense of our firesides and our ideals.

It was a real epoch in the history of chemistry in warfare when the Chemical Warfare Service Section was created as one of the components of our military organization. By its inception the government acknowledged and proclaimed its appreciation of science—entirely too long withheld—for never before has this country realized how indispensable a chemist is in the fabric of our modern economic conditions.

Chemistry is the criterion of a country's very existence. It is the "science of the transformation of matter" underlying all the activities of our complicated social system ever changing, and as well the untold wonders of to-morrow. This fundamental science looks into everything, focuses her light upon everything, directs our paths when the light of nature fails and "allures to brighter worlds" and leads the way. The chemist leads on—harnessing the forces of the universe to his ends, for, in the words of Kipling, "his is the earth and all that is in it." Indeed, for this reason arises the conception that national preeminence in chemical industry means a national world supremacy.

The chemists of America never concerned themselves with the prostitution of science, but called upon to provide our nation with the new diabolic arms of modern scientific warfare developed by a militaristic autocracy, they served ably and completely. Our eminent success is a cause of pride to every American. In

[1] Address delivered at the annual meeting of the Alabama Section of the American Chemical Society in Birmingham, December 7, 1918.

three years American chemical genius has done as much and as well as Germany has during three quarters of a century. This sudden unparalleled achievement will affect our chemical industry for a century. That Monday morning when the last gun was fired we passed into a new age—the beginning of an era of chemical progress, of chemical independence in this country, of research in the unfolding of the secrets of nature to make for a longer, happier life for man, of constructive productiveness for the universal brotherhood of man.

The stimulus of scientific work is enormous and the growth of knowledge astounding. We have thus far reached a position of independence which might not have been attained for decades to come. Let us keep the American chemical flames a-burning, the chemical barometer a-rising. Let American chemical progress tower above all. Let us have a Declaration of Chemical Independence in this country.

Let us now consider the criteria in the development and independence—industrial and scientific—of chemistry in America.

Resultant chemical achievement seems to be the product of four factors—the college and university, the industry, the American Chemical Society, and the government.

THE COLLEGE AND UNIVERSITY IN THIS NEW AGE

The fundamental responsibility rests upon the college and the university—the sources of our chemists. Thorough up-to-date training is the all-important feature. The courses must be standardized and correlated—all welded into one outstanding science. Modern chemistry is getting more and more quantitative. The bonds between mathematics and physics, on the one hand, and chemistry, on the other, have been drawn closer, with the effect that physical chemistry is penetrating every phase of the science, thus widening our outlook and rendering our conceptions more precise. Developing and applying physico-chemical theory and methods, gives us insight into intricate problems and unravels mysteries. Utilizing physico-chemical interpretations in all courses means training in the chemistry of the future. Understanding the "how" of chemical transformation is the only clear path to science, the true, the patient and loving interpretation of the world we live in, the laws governing it and the order and beauty revealed everywhere. Mechanical "rule-of-thumb" mastery of the principles leads one, really crammed with bookwork, to practise what in his case could only be a black art—without inspiration, without orientation. The real achievements of the hour have been brought about by men of thorough training and deep insight into the pure scientific principles. Our institutions therefore should turn out not men who know a lot—assimilators of other peoples' ideas—but research men of creative type of thought.

Modern chemistry developed from the physico-chemical standpoint is radiating in all directions, affecting all sciences and all industries as well as its own branches. It is high time that chemists of the old schools get out of their shells, view and accelerate this growth and application of their science. As we have geological chemistry, photo-chemistry and all the other correlated chemistries with full realization of their service to man, let us stimulate more and more of this correlation not only to the pure but as well to the applied sciences and professions. Indirectly, by way of illustration of the dire need of intensive chemical training in other branches of pursuit—our physician may be put to the test. He prescribes diets and knows little or no food-chemistry. He "interprets" bio-chemical analyses and has little comprehension of physiological chemistry. He deals with the human body—a true colloid—and has not the slightest idea of colloidal chemistry. And so the story goes. Bio-chemical progress is astounding as a result of the application of chemistry to medicine. More of this coordination is needed in teaching, researching and application in every conceivable field. They all involve chemistry.

To give adequate training physical equipment of an institution is an essential efficiency factor. The real contact with the subject is in the laboratory, therefore the necessity for intensive laboratory instruction for the development of technique and systematic scientific observation and deduction.

Apropos, our institutional and industrial laboratories must foster the genuine American spirit of utilizing and encouraging domestic "Made-in-U. S." chemicals and scientific apparatus from precision instruments to filter paper.

A word in regard to a seemingly neglected corps in the service of chemistry—women. Prejudice must be overcome. They have proven to be competent workers. Chemistry is a most fitting field for women. Her natural concentration on matters of minor import, her soundness of judgment, her sense of practical realities are invaluable qualities in a laboratory worker. We must induce more women into the field.

Teachers of chemistry must be gifted with that pedagogic approach and method that will instill and stimulate the scientific spirit. Successful professors of chemistry must profess to be pedagogues as well as chemists. They are indispensable in the successful training of spirited chemists and teachers of chemistry. We must have more chemists of pedagogical training to turn out more successful teachers of chemistry. In preliminary scientific training we must concentrate as much on the methods of teaching, the logical development of the principles from the student's viewpoint, with broad-minded intensification of the far reaching applications of the principles, with greater emphasis on exact scientific expression as on the science itself. Teachers of science must stop scaring beginners away from it because of their hackneyed paraphrased modes of expression far from the student's comprehension. Science is simple clean-cut truth. We practise it daily. Every student can and will understand it if you will appeal to him on his level. Science is a living subject. Let not your language deaden it. Remember that science was not made for language but language for science. Live up to it.

Teachers of chemistry have an equally important task—the man of science is intended for research, all will admit in the light of the modern age; but in whose time and with whose money? A college or university must disseminate knowledge through research as well as through teaching. The double task upon the professor entitles him to be relieved of worry regarding "financial modus vivendi." He is the most important person in the "post-bellum" community in emergencies, in peace and in war. To-day, no fact stands more clearly demonstrated. A soldier and an army can be made in a year, if necessary, but it takes twenty to twenty-five years to make a scientist. His salary should be commensurate with his specialization.

In a word—the great task and responsibility of the college and university to-day is to speed up our intellectual potential.

Industry in Chemical Advancement

Industry has a most important bearing upon chemical advancement. In the first place, exploitation of chemists must cease. Manufacturers must learn to cooperate with their chemists whose skilled service reaps wealth and welfare to both nation and industry. Productive chemists should benefit from the fruits of their success.

Then, too, greater cooperation should be extended the investigator, the elaborator of the content of the science and its farther coordination. One means is by offering graduate industrial fellowships as in the Mellon Institute at Pittsburgh, where school, laboratory and practise are in harmonious heterogeneity. Another is to have an advisory staff of professors of chemistry in different specialties bearing upon the industry directly or indirectly. A third is to have each industrial corporation establish specialized research laboratories in their own plants or contribute to the organization of central institutes devoted to practical technical problems. A further urgent task upon the manufacturer is to concentrate more on and invest more capital in promoting industries essential for daily needs.

There are innumerable industries whose processes are chemical yet these manufacturers are still delving in "cook-book" procedures, ever groping in the dark. The dawn of the brighter chemistry has not struck them as yet. They are still under the false impression that science is a happy family of mutually admir-

ing absent-minded philanthropists striving for the benefit of the human race. They still fail to see the connection between science and their industry. They are not aware that the whole vista opened out by modern chemistry lays bare hitherto unsuspected depths of complexity in the most insignificant things about us. It is ignorance pure and simple and truly a curse upon the nation's advance.

Another condition that must be remedied—the engineer with little knowledge or training in chemistry in charge of the design, erection and control of chemical plants and processes. Associated with him is a routine "analyst," entirely dependent upon him. Neither have any idea of the mechanism and interpretation of chemical processes involving mechanics, hydraulics, hydrostatics, thermodynamics, thermophysics, thermochemistry, physical chemistry and what not. Our pressing obligation, therefore is to train men more profoundly and thoroughly in the fundamental theories of the science—in mathematical, in physical, in biological as well as in the chemical branches. The industrial world to-day demands this type of broadly-trained man.

The unfounded popular craze and cry of intellectual people is for "applied science," failing to realize that there is no applied science until you have science to apply. Pasteur propounded the wonders in bacteriology by attempting to disprove the doctrine of spontaneous generation. Helmholtz never thought of preventing eye diseases when he introduced the ophthalmoscope. Cavendish never dreamed of the double purpose of his idea of "fixing nitrogen" appearing like Brahma in two aspects—Vishna the Preserver and Siva the Destroyer. The world triumphs are indebted to pure science.

THE AMERICAN CHEMICAL SOCIETY IN THE SERVICE OF PROGRESS

Such being the case, our chemical associations should welcome more papers on theoretical than on "dollar" chemistry—of mutual benefit to all its members—teaching, research and technical chemists.

The American Chemical Society, the great growing body of American chemical genius should organize a central research clearing house to receive problems for research from all conceivable sources in the country—industries, schools, research laboratories. These may be published in the journals for interested members to attack.

Then too, the question of handbooks must be settled. It is useless to continue to discuss the matter. Discussions evolve more heat than light. This is no time for talk but for action. We must have our own handbooks in English. We must stop relying on any one for anything. The time has come for independence in educational and scientific materials in this country. There is no greater body than the American Chemical Society to foster by united action this wholesome spirit of scientific independence.

THE GOVERNMENT'S RÔLE IN OUR CHEMICAL INDEPENDENCE

Another vitally important rôle in the establishment of chemical independence in our country must be played by our government.

To stop depending upon foreign sources of supply, our government should utilize and extend its surveys of national resources; enforce their conservation; transform sleeping villages into great centers for industrial activity; enact wise legislation for protective duties which will aid in the improvement of essential industries for daily needs; encourage the use of "Made-in-U. S." materials; carefully consider patent legislation; establish more official experimental stations for theoretical and industrial research; build central scientific research reference libraries indispensable in research in growing industrial centers; continue through "scientific statesmen" to stimulate and encourage research; and give the chemist, the scientist his entitling share to a highly responsible position in national life and in the councils of those directing our national policies. "To him that hath shall be given."

In the midst of all our great chemical progress, our government should concern itself with a feature of dire import—the standardization of the title "chemist." A bottle-

washer, a laboratory assistant, an "analyst" hanging on to the coat-tails of a chemical engineer, a technician "analyzing" urine from morn to midnight, a drug clerk handling chemicals, a coffee or tea "nose" specialist—all cogs in the chemical wheel are to-day classed as chemists together with the professor of chemistry, research and industrial chemists. The title "chemist" must be standardized. Those who by right of training and occupation deserve this name should urge upon our government to lay down definite standards for the profession and place it in the same plane with medicine or law. An institution's diploma or an association's membership or whatever else may be feasible in the national standardization, should represent the chemist's license. Partial action in this direction has been inaugurated by the Chemical Warfare Service Section in classing men as "analysts" who received sufficient training in chemistry to enable them to carry on routine analyses under direction and as "chemists" who have special training in any of the branches of chemistry. This classification is a step in the right direction. It was for the war program. Now let there be a complete classification for the peace program.

To conclude—chemistry has proven to be America's bulwark of defense. In return, America must recognize all the more the indispensable service of the scholar, the thinker, the investigator of science, in national preservation. May our new democratic age stimulate scientists in their search of truth not only for truth's sake but for humanity's sake in our universal brotherhood of man.

I. Newton Kugelmass

Howard University

CHARLES RICHARD VAN HISE

The following minute has been voted by the board of regents of the University of Wisconsin:

Dr. Charles Richard Van Hise, the president of the University of Wisconsin, departed this life November 19, 1918, after an unbroken connection of forty-four years with the institution, as undergraduate, through all grades of the faculty, and as president for the past fifteen years.

Nearly every living alumnus, every faculty member and executive officer has come into intimate personal contact with him during the long period of his connection with the university, and to know him was to love him, to serve with him a privilege, and to serve under him a benediction.

Recognition of his genius, as a scientist, as an educator, and as an executive, comes to us from every quarter of the nation and civilized world. We would not here catalogue his virtues, his excellences, nor his achievements in his many fields of intellectual and personal activity. We knew him as a friend, co-laborer and associate. The many hours we have spent with him are a priceless asset; his activities and his accomplishments are an inspiration to us and a call to better things. We shall miss him as a friend, counsellor and brother; we shall strive to be better for having known him. We mourn with the family, with the university, with the nation, and with the world over his untimely passing. We deplore our loss, but we know that the world is richer for his having lived and served.

The faculty of the University of Wisconsin has drawn up the following memorial resolution in honor of President Van Hise:

We, the faculty of the university, would pay our tribute of respect and love to our departed leader, President Charles R. Van Hise. His death has afflicted us with the deepest sense of public and personal loss. We rejoice, however, in the service that he rendered to his fellow men. He preached the gospel of service, and he practised it with insight and energy. His service was not the condescension of the great to the humble, but the solicitude of the elder brother for his brethren. To him the great object in life was to release the capacities of men, to help them learn how to help themselves.

His broad conception of the part that the university should have in this work of spiritual liberation was firmly grounded in respect for pure scholarship, and his success in securing its fuller realization is one of his titles to grateful remembrance. He had a democrat's faith in the ability of the people of Wisconsin to recognize the worth of university training. No opposition, no doubts or fears, could shake his confidence in their unfaltering and full support of the university which sought to open to all a door to richer and nobler living.

He was truly a democratic leader. He was

simple in his tastes, delighting in the curling smoke of the campfire and the small, still voices of the wild woods. He was accessible to every one and sought advice from all who would offer it; he respected honest opponents and worked with them as harmoniously after a conflict as before; he endured even malicious personal criticism with serenity. His tolerance was indeed amazing, and it sprang, not from indifference or disdain, but from single-hearted devotion to the larger, benign purposes that he cherished for men, and from the concentration of his strength upon the effort to realize them.

It was characteristic of the steady and consistent broadening of his interests that he passed from the study of the forces which have knit the outer fabric of the earth to the investigation of some of the potent influences which make or mar the welfare of men. The well-being of the people of Wisconsin, of the people of the nation, engaged the productive energies of his mature manhood. When the great war came and threatened the destruction of western civilization, he bent all the powers of his mind and heart to the great problem of gaining the victory for liberty and justice, and then, in these later, stupendous weeks, to a greater problem of making that victory secure through the organization of a brotherhood of free nations. The leader who began his presidency with the noble ideal of freeing human capacity throughout the commonwealth of Wisconsin fittingly crowned his too brief days, in the fulness of his powers, with well-wrought plans for ensuring to national and to individual capacity a free opportunity throughout a liberated world.

We rejoice that he has dwelt among us and that his spirit has moulded and will continue to mould the life of the university. "They may rest from their labors; and their works do follow them."

SCIENTIFIC EVENTS

THE PRODUCTION OF MARBLE IN 1917

THE value of marble sold in the United States in 1917, according to reports made by the producers to G. F. Loughlin, United States Geological Survey, Department of the Interior, was $6,330,387, a decrease of 10 per cent. ($702,784) from the value in 1916 and the lowest annual value for our marble output since 1904. The quantity produced in 1917 was about 3,627,750 cubic feet (310,130 tons), as against about 4,795,000 cubic feet (409,970 tons) in 1916—a decrease of 24 per cent. The quantity produced in 1917 included a small proportion of serpentine, as shown in a later paragraph, but no "onyx marble."

Of the marble sold in 1917, 2,156,351 cubic feet (about 184,370 tons), valued at $6,100,280, was building and monumental marble—a decrease of 33 per cent. in quantity and 11 per cent. in value compared with 1916. The average price of this stone per cubic foot was $2.83 in 1917 and $2.13 in 1916.

The marble sold for use as flux, terrazzo and mosaic work, and ornamental stone, and the pulverized marble sold for use in agriculture and in manufactures amounted to 125,764 tons, valued at $230,107. The marble sold for these purposes in 1916 amounted to 136,217 short tons valued at $209,155.

The total value of marble sold in 1917 for use as building stone (3,702,563) was 22 per cent. less than that sold in 1916, and the total quantity (1,470,793 cubic feet) was 35 per cent. less. Exterior building stone, which represented 36 per cent. of the total quantity of building stone, decreased 37 per cent. in quantity and 25 per cent. in value; stone for interior work, which represented 64 per cent. of the total quantity, decreased 34 per cent. in quantity and 20 per cent. in value. Marble sold dressed for use in the exterior of buildings was the only building stone product that showed increase in quantity (13,549 cubic feet) in 1917; but the value of this product decreased $38,328 (4.7 per cent.). The general average price of marble sold as building stone (rough and dressed) in 1917 was $2.52 per cubic foot; the average value of exterior stone was $2.05 and of interior stone $2.77. Vermont and Tennessee produced over 56 per cent. of the quantity of marble quarried for use as building stone, each state reporting over 390,000 cubic feet. Vermont's output was nearly equally divided between exterior and interior stone, whereas 97 per cent. of Tennessee's product was interior building stone. About 37 per cent. of the Vermont and over 50 per cent. of the Tennessee marble was sold as rough stone. Georgia and Missouri were the next largest producers of building marble,

the quantity produced in each state exceeding 100,000 cubic feet.

The value of the marble produced for monumental use in 1917, including rough and dressed stone, increased $318,307 (15 per cent.) over that in 1916. The quantity, however, decreased 255,230 cubic feet (27 per cent.). The average price per cubic foot was $3.50 in 1917, which was $1.29 more than in 1916. There was a large increase in the quantity of dressed monumental stone sold in 1917—107,403 cubic feet (54 per cent.), but a decrease of 362,926 cubic feet (49 per cent.) in the quantity of rough stone. Vermont produced more than 55 per cent. (377,418 cubic feet), and Georgia more than 25 per cent. of the country's output of monumental marble. Missouri, New York and Tennessee rank next in this product.

Marble for ornamental and "other uses" declined in quantity but increased in value in 1917, as it did in 1916. Marble for "other uses" includes rough stone sold to lime burners, to carbonic acid factories, to pulp mills and to blast furnaces; crushed stone for road metal and terrazzo; small cubes for mosaics; and finished stone for electrical apparatus and ornamental purposes. The stone sold for flux to blast furnaces amounted to 21,194 long tons, valued at $24,899, and for terrazzo to 17,551 short tons, valued at $51,218. In 1916 the stone sold for terrazzo was 24,340 short tons, valued at $83,466.

THE BRITISH NATIONAL UNION FOR SCIENTIFIC WORKERS[1]

The first general meeting of the National Union of Scientific Workers was held on October 27, and was attended by representatives of eleven branches with more than five hundred members. The constitution of the union was determined, subject to slight alterations in redrafting the rules. It was agreed upon by the meeting that the objects of the union should include:—(1) To advance the interests of science—pure and applied—as an essential element in the national life; (2) to regulate the conditions of employment of persons with adequate scientific training and knowledge and (3) to secure in the interests of national efficiency that all scientific and technical departments in the public service, and all industrial posts involving scientific knowledge, shall be under the direct control of persons having adequate scientific training and knowledge. Special objects deal with obtaining adequate endowment for research and advising, as to the administration of such endowment, setting up an employment bureau and a register of trained scientific workers, and obtaining representation on the Whitley industrial councils. An applicant is qualified for membership if he or she has passed the examination leading to a university degree in science, technology, or mathematics, and is engaged at the time of application on work of a required standard, though certain other qualifications are regarded as equivalent to university degrees and admitted in lieu thereof. A resolution was carried unanimously that a special advisory committee should be appointed to deal with questions arising in connection with the promotion of research. At the close of the meeting the officers for the ensuing year were appointed as follows: *President:* Dr. O. L. Brady (Woolwich). *Secretary:* Mr. H. M. Langton (miscellaneous). *Treasurer:* Mr. T. Smith (National Physical Laboratory). *Executive:* Mr. G. S. Baker, Dr. N. R. Campbell, Dr. C. C. Paterson (N.P.L.), Mr. R. Lobb, Mr. J. W. Whitaker (Woolwich), Dr. H. Jeffreys, Dr. F. Kidd (Cambridge), Dr. C. West (Imperial College), and Dr. A. A. Griffith (Royal Aircraft Establishment). The address of the secretary is Universal Oil Co., Kynochtown, Stanford-le-Hope, Essex.

[1] From *Nature*.

THE DE LAMAR BEQUESTS FOR MEDICAL RESEARCH

The will of Captain Joseph Raphael De Lamar, mine owner and director in many large enterprises, leaves nearly half of his estate, estimated at $20,000,000, to the Harvard University Medical School, Johns Hopkins University and the College of Physicians and Surgeons of Columbia University for medical reseach into the cause of disease and into the principles of correct living. The

bequests to these institutions in equal shares consist of his residuary estate, estimated at about $10,000,000. He gave a trust fund of $10,000,000 to his only child, Alice Antoinette De Lamar, with the provision that if she dies without issue the principal of this fund also goes to the institutions named. The clause setting aside the residuary estate requests that the fund be used as follows:

> For the study and teaching of the origin of human disease and the prevention thereof; for the study and teaching of dietetics and of the effect of different food and diets on the human system, and how to conserve health by proper food and diet and in connection with the foregoing purposes to establish and maintain fellowships, instructorships, scholarships and professorships; to construct, maintain and equip laboratories, clinics, dispensaries and other places for such study and research and to provide proper housing of same; to publish and disseminate the results of such study and research, not only in scientific journals and for physicians and scientists, but also, and this I especially enjoin on the legatees, by popular publications, public lectures and other appropriate methods to give to the people of the United States generally the knowledge concerning the prevention of sickness and disease, and also concerning the conservation of health by proper food and diet.

The will suggests that the legatees use any means they deem expedient for the purposes named, and requests that the fund be kept intact.

SCIENTIFIC NOTES AND NEWS

THE Royal Society has awarded its Darwin medal to Professor Henry Fairfield Osborn, president of the American Museum of Natural History, in recognition of his research work in vertebrate morphology and paleontology. The Copley medal goes to Professor H. A. Lorentz, late professor of physics in the University of Leyden, For. Mem. R.S., for his researches in mathematical physics; the Davy medal to Professor F. S. Kipping, F.R.S., professor of chemistry, University College, Nottingham, for his studies in the camphor group and among organic derivatives of nitrogen and silicon; a Royal medal to Professor F. G. Hopkins, F.R.S., professor of bio-chemistry in the University of Cambridge, for his researches in chemical physiology.

SIR J. J. THOMSON was reelected president of the Royal Society at the anniversary meeting on November 30. The other officers are: *Treasurer:* Sir Alfred Kempe. *Secretaries:* Professor Arthur Schuster and Mr. W. B. Hardy. *Foreign Secretary:* Professor W. A. Herdman. *Other Members of the Council:* Sir George B. Beilby, Profesor V. H. Blackman, Mr. C. V. Boys, Sir James J. Dobbie, Sir Frank W. Dyson, Dr. M. O. Forster, Professor F. W. Gamble, Dr. J. W. L. Glaisher, Sir Richard Glazebrook, Sir Alfred D. Hall, Sir William Leishman, Professor W. J. Pope, Dr. W. H. R. Rivers, Professor E. H. Starling, Mr. J. Swinburne and Professor W. W. Watts.

THE Swedish Academy has awarded the Nobel prize for physics for the year 1917, to Professor C. G. Barkla, professor of natural philosophy in the University of Edinburgh, for his work on X-rays and secondary rays. The prize in physics for 1918 and that in chemistry for 1917 and 1918 have been reserved.

DR. PIERRE ROUX, director of the Pasteur Institute of Paris for many years, will retire from that post. He will be succeeded by Dr. A. C. Calmette, director of the Pasteur Institute of Lille.

THE Salters' Company has appointed Dr. M. O. Forster, F.R.S., to be the first director of the newly established Salters' Institute of Industrial Chemistry.

DR. GEORGE DAVID STEWART has been elected president of the New York Academy of Medicine.

MR. F. K. BEZZENBERGER, of Harvard University, has been commissioned captain, and is stationed at Cleveland as gas chemist in the Chemical Warfare Service.

DR. ROBERT P. FISCHELIS, director of the control department of the H. K. Mulford Co., has entered the Chemical Warfare Service and has been stationed at the control lab-

oratory of the Gas Defense Plant, Long Island City, N. Y.

Dr. Solon Shedd, head of the department of geology, State College of Washington, has been granted leave of absence for a year to engage in the production of casing head gasoline in the Oklahoma oil fields.

Dr. J. N. Rose, associate curator of the division of plants, U. S. National Museum, has returned from Ecuador where he spent three months' making botanical collections and has brought back a large series of specimens.

At the anniversary meeting of the Mineralogical Society, London, held on November 5, the following officers and members of council were elected:—*President:* Sir William P. Beale, Bart. *Vice-presidents:* Professor H. L. Bowman and Mr. A. Hutchinson. *Treasurer:* Dr. J. W. Evans. *General Secretary:* Dr. G. T. Prior. *Foreign Secretary:* Professor W. W. Watts. *Editor of the Journal:* Mr. L. J. Spencer.

At the annual meeting of the New York Academy of Science on December 16, the address was given by Professor S. A. Mitchell, of Leander McCormick Observatory, University of Virginia, his subject being "Results of the eclipse of 1918."

Mr. Vilhjalmur Stefansson was presented with the gold medal of the American Geographical Society at its monthly meeting on the evening of December 17, in the Engineering Societies building, 29 West 39th Street. Mr. Stefansson delivered an address on "The value of northern exploration."

We learn from *Nature* that the council of the Chemical Society, London, has arranged for three lectures, bearing on the ultimate constitution of matter, to be delivered during the present session. The first lecture, entitled "The conception of the chemical element as enlarged by the study of radio-active change," was delivered by Professor F. Soddy at the ordinary scientific meeting held at Burlington House on December 10.

M. Paul Kestner, the president of the French Society of Chemical Industry, delivered an address on "The Alsace potash deposits and their economic significance in relation to terms of peace," to the London Section of the Society of Chemical Industry on November 4.

On November 20 the opening address of the one hundred and sixty-fifth session of the Royal Society of Arts was delivered by Mr. Alan A. Campbell Swinton, chairman of the council, his subject being "Science and the future."

The death is announced of Dr. Henry Gustav Beyer, U. S. N., retired, who died at his home in Washington, D. C. He was born in Saxony in 1850, and was graduated from the Bellevue Hospital Medical College in 1876. He entered the United States Navy in that year as an assistant surgeon and reached the rank of medical director in 1911, retiring a year later.

Harvey E. Vasey, associate professor of botany in the Colorado Agricultural College, died at Fort Collins, Colorado, on December 10. At the time of his death he was second lieutenant in the Students' Army Training Corps, assigned as personnel adjutant.

Miss Rose M. Taylor, M.S., for ten years instructor in botany at the Michigan Agricultural College, died on December 6, after a short illness as a consequence of influenza.

Vern B. Stewart, Ph.D. (Cornell), succumbed to pneumonia on December 3, aged thirty years. Dr. Stewart held a research position as assistant professor of plant pathology at Cornell University for five years, during which time he made numerous contributions to his science. The most notable of these concern diseases of horticultural and ornamental nursery stock. On July 1 last he became pathological adviser to the eastern market inspectors of the U. S. Department of Agriculture. This work had to do particularly with detecting incipient disease in shipments of perishable plant products intended for the army and navy. Exposure in the performance of this duty led to the fatal attack.

Major Harry Douglas Gill, for thirty years connected with the New York University Veterinary College as member of the teaching staff in surgery, secretary and president,

died at Waynesville, N. C., on October 3 at the age of fifty-seven years. The college announces the establishment of the Major Harry Douglas Gill Scholarship "to give some poor New York boy an opportunity to get four years' training in veterinary surgery and medicine."

PROFESSOR H. E. J. G. DU BOIS, known for his contributions to the knowledge of magnetism, died at Utrecht on October 2.

SIR HENRY THOMPSON, professor of physiology and later of medicine at Dublin, the author of important researches on physiological chemistry and nutrition, was one of the victims of the sinking of the *Leinster* on October 10.

COPIES of *Nature* just received contain obituary notices of five men who attained to distinction in science while engaged primarily in other work and who died at the average age of ninety years. Sir Edward Fry, a distinguished English jurist, who at the same time made valuable contributions to botany, died on October 18, in his ninetieth year; the Rev. A. M. Norman, F.R.S., honorary canon of Durham, and an eminent worker in many fields of natural history, died on October 26, at eighty-seven years of age; Mr. Thomas Codrington, who died on October 21, aged eighty-nine, was a civil engineer, who made important contributions to geology; R. Brudenell Carter, the English ophthalmic surgeon and author of works upon ophthalmic subjects, died on October 23 at the age of ninety years, Sir Herman Weber, the distinguished London physician an authority on climatology, died on November 11, in his ninety-fifth year.

THE directors of the Fenger Memorial Fund have set aside $500 for medical investigation. It is preferred to assist in work of a direct clinical bearing which may be carried out in an established institution, which will furnish the necessary facilities and ordinary supplies free of cost. Applications with full particulars should be sent to L. Hektoen, 637 South Wood Street, Chicago, before January 15, 1919.

THE American Veterinary Medical Association through its president, Dr. V. A. Moore, of Ithaca, N. Y., has appointed committees, one of five from the United States and one of three from Canada to assist in the war departments of the respective countries, and dealing with veterinary reconstruction problems.

THE executive committee of the American Federation of Biological Societies has voted to withdraw the annual meeting scheduled for Baltimore this year. It has been suggested that a meeting be held some time during the spring.

THE annual meeting of the American Association of University Professors will be held at the Johns Hopkins University Club, Baltimore, on Saturday, December 28. The program will be largely devoted to a discussion of college and university education under conditions of reconstruction. Professor John M. Coulter, of the University of Chicago, is president of the association as well as of the American Association for the Advancement of Science. Profesor H. W. Tyler, Massachusetts Institute of Technolgy, is the secretary.

THE Bay Section of the Western Society of Naturalists held a two-day session at Stanford University, November 29 and 30, 1918. The local committee of arrangements included J. R. Slonaker, J. O. Snyder and G. J. Peirce, and an enjoyable and profitable program of scientific papers and social affairs was provided. Those who presented papers were as follows: David Starr Jordan, Miss Alice Eastwood, Ivan C. Hall, W. E. Allen, J. R. Slonaker, A. W. Meyer, Miss Annie May Hurd, J. Grinnell, Barton W. Evermann, C. H. Shattuck, W. W. Cort, E. B. Babcock, J. O. Snyder, E. P. Rankin, R. W. Doane, J. A. Long, G. J. Peirce, E. D. Congdon, Charles V. Taylor, S. D. Townley, Forrest Shreve and D. T. MacDougal.

L'Italia che Scrive for June last contains an article on Italian geographical periodicals by Roberto Almagià, which is abstracted in the *British Geographical Journal*. Of these the *Bollettino della R. Società Geografica*

Italiana is, of course, the most important. *L'Esplorazione Commerciale,* the organ of the "Società Italiana di esplorazioni geografiche e commerciali," and *L'Africa Italiana,* published in Naples by the Società Africana Italiana, have both shown signs of increased activity of late years. They are monthlies and deal respectively with commercial and African geography from the Italian point of view. The *Archivio Bibliografico Coloniale* is a quarterly devoted entirely to the new colony of Tripoli. From the energetic "Istituto Geografico De Agostini" of Novara comes *La Geografia, Rivista di Propaganda Geografica,* ten numbers now being published annually. The purpose of the *Rivista Geografica Italiana* is to stimulate interest in geography, more especially in the geography of Italy. It is the organ of the "Società di Studi Geograpfici e Coloniali," but it is quite independent. It also appears ten times during the year. The *Rivista* owes not a little of its importance to the support of the able professors of geography, notably the Marinellis, father and son, who have done so much to make Florence the leading center of geography in Italy. In Florence also are published Giotto Dainelli's *Memorie Geografiche,* which take the form of long monographs, more especially those dealing with the geography of Italy; the *Rassegna della Letteratura Geografica,* a critical view of geographical literature; and the *Rivista di Geografia didattica,* which is concerned with the educational side of geography. All these are published under the auspices of the *Rivista Geografica Italiana.* The writer goes on to regret the absence of a periodical devoted exclusively to the geography of Italy. The publications of the Italian Alpine Club and the monthly bulletin of the "Touring Club Italiano," however, do something to supply this want.

Nature states that the German Chemical Society has celebrated its jubilee by collecting a fund of two and one half million marks for the more extensive publication of chemical works of reference, such as Beilstein. In a report of the annual general meeting an agreement has been concluded with the Verein deutscher Chemiker with regard to publications. The *Chemisches Zentralblatt* will deal more fully with technical chemistry, and will be available to the members of the latter society at a reduced rate. The *Berichte* will be subdivided, one section dealing with reports of meetings, notices, etc., the other containing the original scientific publications. The annual subscription to the German Chemical Society will become 10 marks, but will then only entitle members to receive the first of the abovenamed sections. A separate subscription will be required for the scientific section, as was already the case with the *Zentralblatt.*

We learn from *Nature* that in accordance with the decision arrived at at the extraordinary general meeting of the Institute of Chemistry held on April 27, local sections are now being formed in various important centers. The inaugural meeting of the Liverpool and North-Western section of the institute was held on Thursday, September 12. The registrar, who was in attendance by the direction of the council, referred to the objects to be attained by the establishment of local sections. It is anticipated that local sections will be inaugurated during the coming session at Manchester, Birmingham, Edinburgh, Glasgow, Gretna, and probably other centers.

At the request of the Bureau of Standards at Washington, government testing of rubber tires will henceforth be carried on at the labortories of the University of Akron for the Akron district and all factories west of Akron. Tires purchased on specification by the government from various rubber companies will be chemically tested by a staff of men assigned to the laboratories under direction of the Bureau of Standards. The work will be installed and supervised under the direction of Mr. Arnold Smith, an Akron man and formerly a student at the municipal university, now employed at the Bureau of Standards. In all probability a force of at least a dozen chemists will be employed in this work. Entire direction of the work will be assumed by the Bureau of Standards and the University

of Akron will furnish space and to a certain extent equipment.

UNIVERSITY AND EDUCATIONAL NEWS

THE late W. J. Murphy, owner and publisher of the Minneapolis *Tribune*, left a large part of his fortune in trust for the establishment of a school of journalism in the University of Minnesota.

THE endowment fund being raised for the establishment of a University College in Swansea has been augmented by donations of £25,000 from Mr. F. Cory Yeo and £10,000 from Mr. W. T. Farr, retiring directors of the Graigola Merthyr Co., Ltd. More than £100,000 have so far been subscribed.

THE sum of £1,000 has been given to the City of London School by Professor Carlton Lambert for the foundation of a science scholarship.

DR. HERMAN CAREY BUMPUS, president of Tufts College for the past four years, has resigned. Dr. Bumpus had been previously professor of comparative anatomy, at Brown University and director of the American Museum of Natural History.

PRESIDENT EDMUND J. JAMES, of the University of Illinois, has withdrawn his resignation. Some time ago he asked to be permanently relieved of his duties at the university in order that he might devote all his time to war work. With the signing of the armistice he has reconsidered that decision.

DEAN E. C. JOHNSON, for the past seven years dean of the division of extension at Kansas State Agricultural College, has accepted an appointment as dean of the College of Agriculture and director of the Experiment Station at the State College of Washington.

DR. LAWRENCE JOSEPH HENDERSON has been promoted to be professor of biological chemistry at Harvard University.

STEPHEN S. VISHER, Ph.D. (Chicago, '14), has accepted an assistant professorship in geography in the University of Indiana.

MR. HARRY L. COLE, who has been in the Aviation Service while on leave from the State College of Washington, will resume his academic duties on January 15, as instructor in the department of chemistry.

DISCUSSION AND CORRESPONDENCE

SYNTHESIS OF PALEONTOLOGY AND MEDICAL HISTORY

THE study of the ancient evidences of disease, for which the term paleopathology was proposed by Ruffer in 1914 during his studies on the pathology of ancient Egyptian mummies, is a phase of medical history which must depend upon paleontological data for its extension. That pathological lesions, especially those on the bones, retain all of their characteristics after many hundreds of thousands and millions of years has been clearly shown and distinct evidences of disease are known as far back in geological time as the Carboniferous. Evidences of traumatism, fractures with the formation of callosities on the inner surface of the shells of brachiopods have been seen as old as the middle of the Ordovician. Reasoning from the theoretical aspects of paleopathology, on the basis of possible parasitism of early hosts, disease may have originated in the Archeozoic but there is no definite recorded evidence prior to the Pennsylvanian.

The relation of paleontological data to medical history is based on the assumption that the manifestations of disease are the same whether seen on man or in animals, and the infection of a Cambrian crustacean by Protozoa is as much a matter of medical history as the presence of osteophytes on the femur of *Pithecanthropus*, the fractured ulna of the Neanderthal man, or bilharziosis among ancient Egyptians.

Many lesions are so commonly seen among fossil vertebrates especially that paleontologists have not referred to them at all, or merely mentioned them incidentally, forgetting that such evidences are of extreme importance in tracing the origin and antiquity of phenomena which are of such vital importance to humanity to-day.

The importance of paleopathology is that it gives an opportunity of studying evidences of disease over a great period of time, and especially is this true in regard to the data offered by paleontology. That the study of these evidences may aid in the solutions of problems which are at present not solved is evident when we consider that many epidemics which sweep the world, such as the one just past, are doubtless the result of an accumulation of changes over a long period of time. It is well known in medical history how whole populations have been swept away by scourges, which, had the people understood them, could have been avoided, and in the future when we come to understand all of the events of past history we may be better prepared to avoid future conditions of a like nature.

A disadvantage under which the student of paleopathology works is that the results of epidemics are scarcely ever recorded especially in paleontological material. The presence of tsetse flies in the Oligocene of Colorado suggests the possibility of trypanosomiasis among the herds of artiodactyls and perissodactyls of the early Tertiary but it can be considered merely suggestive. The search for such evidences is, however, just begun, and we may in future learn more of the epidemics which, in the past, must have swept through the herds of early animals.

The careful description, illustration and study of ancient cases of fracture, of diseased bones or any evidences of pathology is extremely desirable and will advance the study of paleopathology. Evidences of disease may be detected in the positions assumed by animals at death, the opisthotonos, the pleurothotonos and related phenomena. It is a question open to discussion whether the opisthotonic attitude is a manifestation of disease, but it is as suggestive of neuro-toxic disturbances as may well be. Whether the position assumed by the fossilized skeleton is the same as the animal assumed at death, how much is due to shifting before fossilization, are matters of minor importance to the student of medical history who is chiefly impressed with the fact that a dinosaur preserved in the opisthotonic attitude suggests to him the spasms seen in many recent diseases. The student of medical history is interested in a Mesozoic fracture because it extends his knowledge of traumatism, and if the study of the fracture is complete it adds to his knowledge of general pathology.

The relation of disease to extinction, and other more important relations, may be cleared to some extent by a study of paleontological material. The part disease has played in the evolution of forms, whether retarding, changing, or ending their development also attracts the attention of the student of paleopathology.

Medical history, like all other histories, is based on an accumulation of data from widely different fields, and it is the privilege of paleontologists to add to the great wealth already accumulated, more data as to what happened among the animals with which they are familiar, representing the inhabitants of the earth millions of years ago. The subject is worthy of more careful consideration than has been given it in the past. Paleopathology has attracted scant attention among paleontologists but eminent students such as Cuvier, Soemmering, Goldfuss, Schmerling, Leidy, Williston have found the subject of interest. It remained for the men who had been trained in pathology, men like von Walther, Mayer and Virchow, to show the exact relation of pathological lesions among extinct animals to the general problems of disease which are interesting men to-day.

Roy L. Moodie

University of Illinois,
Chicago

A RECENTLY DISCOVERED ART CAVERN IN FRANCE

Under the auspices of the French Académie des Inscriptions and over the signature of M. Ch. Dauzats, there appeared in *Le Figaro* of September 7 an interesting notice of another remarkable discovery of ancient cave paintings in southern France. A translation of the article follows:

These are the most ancient records of human art, as M. Salomon Reinach was remarking yesterday when congratulating Count Begouen who, with his three sons, has just

discovered the above records while exploring the prehistoric cavern at Montesqui-Avantes in Ariège.

The first finds of Count Begouen and his sons, which we mentioned when brought forth in 1914, before the war, were of great interest to the institute.

Some months later the three brothers departed for the front. What they have done there may be learned from the numerous and splendid citations which we have published. But that which they accomplished for science during their furloughs was not known. Yet it is of consequence that we learn and for that reason their father came yesterday to tell the academy that in June last during one of these furloughs which reunited all three sons at Montesqui-Avantes he continued with them the exploration of the Ariège cave.

This time Count Begouen and his sons discovered on the walls of the subterranean galleries some engravings estimated to be thirty thousand years old, and in such quantity and variety that the extraordinary ensemble of prehistoric art work constitutes a veritable museum.

The animals figured in the cave are considerable in number and include reindeers, bisons, horses, both isolated and in groups; bears, elephants and rhinoceroses. The representations of felines are very rare in prehistoric art; but MM. Begouen have photographed in their cave a genuine lion, executed in bas-relief. They have made out also several birds including swans, ducks, as well as three predatory night fliers.

The human figure is likewise represented in the cave, which in recognition of the sons of Count Begouen has been baptized "the Cave of the Three Brothers." A silhouette is particularly remarkable, almost baffling. It represents a man in motion; a man of powerful body, whose head and shoulders are joined by an enormous neck; a man whose upper and lower limbs and whose hands and feet are perfectly human, but whose vertebral column is prolonged in an exterior appendage resembling that of the anthropoids; a man, at last, *qui marche a quatre pattes!*

The suggestions prompted by the magnificent discovery of MM. Begouen have long held the attention of the academy. MM. Dieulafoy, Salomon Reinach, Edmond Pottier, Langlois, Louis Leger, Bouché-Leclercq are particularly interested.

Several communications have been made on the subject by MM. Homolle and Clermont-Ganneau.

N. C. NELSON

SCIENTIFIC BOOKS

The Destinies of the Stars. By SVANTE ARRHENIUS. G. P. Putnam's Sons. 1918. Pp. xvii + 256, illustrated.

In 1903 Dr. Arrhenius was awarded the Noble Prize for his researches in the field of electro-chemistry. To the study of the development of the celestial universe, he, therefore, brings the mind of a trained chemist; the mind of one who is especially fitted to grapple with the intricate problems of the evolution of the stars and planets from the formless masses of gaseous nebulae.

In "The Destinies of the Stars" this evolution is traced through the spiral nebulæ, the gaseous stars, the sun, the worlds to be, Jupiter and Saturn, the world, to the final destiny of all, the dead planets, Mercury and Mars. In this general theory of growth and decay there is, of course, little that is new, but Dr. Arrhenius treats the matter in a new way and brings out many new points.

The chapter devoted to the planet Mars is especially interesting. In this the so-long popular fantastic ideas of Lowell are scientifically and clearly discussed, and the utter impossibility of any life, such as we have any conception of, existing on Mars is conclusively shown. The inhabitants of this planet, the wonderful system of irrigating canals, the whole fabric of intensely interesting fact and fancy so cleverly woven by Lowell, are shown by the clear, concise reasoning of the chemist to be only "such stuff as dreams are made of."

The book is decidedly interesting and well worth careful reading. It lacks, however, continuity. This is due, undoubtedly, to the

fact that the book was not written as a whole, but is a collection of lectures, delivered at various times and places, on different aspects of the general problem of the evolution of the universe.

CHAS. LANE POOR

Modern Navigation. By FRANK SEYMOUR HASTINGS. D. Appleton & Co. 1918. Pp. xvi + 84, illustrated. With introduction by Rear-Admiral Albert Gleaves, U. S. N.

In "Modern Navigation" the author has rendered a real service to all interested in the safe navigation of the seas. In the last quarter of a century there have been many improvements in the art of finding one's place at sea, and the officers of our Navy have been quick to take all possible advantage of these inventions and improvements. Not so, however, with those responsible for the vessels of the mercantile marine. These vessels have been navigated and are being navigated to-day by methods requiring long and cumbersome calculations, by methods long obsolete in the Navy.

When the necessity of manning the vessels, now being built under the emergency of war, was recognized, the government started schools for the training of many thousands of seamen to rank as mates and masters in the new mercantile marine. The attention of those in charge of this training was early called to these new methods and they were urged to start the future navigators right, to discard all the obsolete methods, and to substitute the simple modern method. This was not done: the training has gone on along the old fashioned and antiquated ideas of a past generation. The time and energy of thousands of bright, aspiring young men are being wasted, and old, worn out methods are being fastened on the next generation, all because the power to grant licenses to masters and mates rests in the hands of a few retired seamen, who have failed to keep abreast of the advances in their profession. For this reason the book of Mr. Hastings is most timely; it may help to bring the great advantages of modern methods before the officers and students of the training schools.

This small book gives a short account of the St. Hilaire method. Very wisely all extraneous matter is eliminated, and the book is confined to the bringing before the merchant officer the advantages of the Navy method. The working of this method is shown by a number of concrete examples, and the book is well illustrated with carefully prepared diagrams. The book, however, lacks a clear explanation of the fundamental principles of a "line of position," and of the real underlying basis of the St. Hilaire method.

It is certainly refreshing to see a book on navigation, which is something more than a mere compilation from treatises of a past generation.

CHAS. LANE POOR

SPECIAL ARTICLES

RHINEODON TYPUS, THE WHALE SHARK—FURTHER NOTES ON ITS HABITS AND DISTRIBUTION

In a brief note published in SCIENCE in 1913[1] I recorded the second taking in Florida waters of this great fish. As an interesting coincidence it may be pointed out that this specimen is the second ever taken in the Atlantic Ocean, or, so far as records go, ever seen therein. In a later and more extensive paper,[2] I gave the details of the capture of this fish with as full a description and as many photographs as possible, and followed these with the natural history of the fish as contained in the writings of those scientists who have been privileged to study it at first hand. Reproduced in this larger paper were all the known figures of this great shark. Inasmuch as in the course of this work there were brought to light a number of accounts and descriptions of this greatest of all sharks which up to that time had remained unknown, it was believed that the paper contained a

[1] Gudger, E. W., "A Second Capture of the Whale Shark, *Rhineodon typus*, in Florida Waters," SCIENCE, 1913, N. S., Vol. 38, p. 270.

[2] "Natural History of the Whale Shark, *Rhineodon typus* Smith," *Zoologica:* Scientific Contributions, New York Zoological Society, 1915, Vol. I., pp. 349–389, 14 figs.

résumé of all the known accounts of the fish. However, during the summer of 1917, while at work on the Bibliography of Fishes in the department of ichthyology of the American Museum of Natural History in New York City, I found a few hitherto unknown references to the whale shark. Since these are of themselves interesting and since they extend our knowledge of its recorded habitat, it seems worth while to collect and publish them as a postscript to the paper referred to above.

Lest any one, seeing the title only, should be misled by it, it may be well to say by way of introduction to our subject, that in the Report of the British Association for the Advancement of Science (Liverpool Meeting, 1870), 1871, page 171, occurs the title "On *Rhinodon typicus*, a Rare Shark lately Added to the Free Museum, Liverpool." However, no data whatever are given.

Furthermore, Lütken's[3] paper, "Om Haplægten Rhinodon" (1874), consists of but a few remarks by this distinguished ichthyologist on the similarity of the gill apparatus of *Rhinodon* to that of the great basking shark, *Selache maxima*. Further than this mere statement, the paper in question does not concern us.

Taking our references chronologically, the next one is very interesting. Julian Thomas (1887) while at anchor in Red Scar Bay, on the south side of New Guinea says that:[4]

> A school of sharks twenty-five to forty feet long now surrounded us. . . . The fish came right underneath the bows, and then quietly floated astern on top of the water. We could have touched him with our hands by leaning over the bulwarks. . . . This was a shark—an enormous mottled brute, which seemed as long as our ship. He turned partly over and showed his frightful jaws, which would have taken in a man whole. He was by the computation of the captain and all hands, at least forty feet long, with a six-foot "beam." . . . The sharks were all around, not one of them apparently under twenty-five or thirty feet long. The "boomer" appeared to lead them, and they swam around us both to port and starboard. It almost seemed as if they meant to attack the ship.

This great fish was impervious to bullets, for when fired at with rifles, "The bullets ricochetted off the brute's back" and "shot after shot was fired without much apparent effect." Thomas calls this shark *Selache maxima*, probably because that was the largest shark known to him, but there is no reason to doubt its being *Rhineodon typus*, the giant of all the sharks. His reference to the color and great size effectually settles that.

Those who read my larger article will recall that Captain Steuart[5] says that around the coasts of Ceylon the spotted shark was always surrounded by smaller sharks of which it was the leader. Also Thomas's ricochetting bullets recall what Mr. Brooks wrote me as to the impermeability of the hide of the second Florida specimen to rifle balls.

Of somewhat doubtful value is the following brief account found in a work compiled and edited by Paul Fountain from the notes of Thomas Ward[6] of Australia (1907). It is of doubtful value because, although the fish passed in full view at a distance of eighty yards, no mention is made of the yellow spots and vertical bars which ornament it. These may have been indistinct, or the fish may have been in line with the sun, or it may have been a specimen of *Selache maxima*, to the presence of which in antipodal waters as recorded by the Australian ichthyologists the present writer has recently called attention.[7] Be the explanation what it may, the incident is given for what it is worth.

Fountain had been cruising near the head of the Great Australian Bight, when he fell

[3] Lütken, C. F., "Om Haplægten Rhinodon," *Videnskabelige Meddelelser Naturhistoriske Forening*, Kjobenhavn aarene 1873, 1874, p. 2.

[4] Thomas, Julian, "Cannibals and Convicts: Notes of Personal Experiences in the Western Pacific," London, 1887, p. 380.

[5] Steuart, James, "Notes on Ceylon, etc.," London, 1862, p. 156.

[6] Ward, Thomas, Paul Fountain, editor, "Rambles of an Australian Naturalist," 1907, pp. 119–120.

[7] Gudger, E. W., "On the Occurrence in the Southern Hemisphere of the Basking or Bone Shark, *Cetorhinus maximus*," SCIENCE, 1915, N. S., Vol. 42, pp. 653–656.

in with a school of sixty-feet sperm whales. His words are:

Before the last of them was out of sight, an enormous shark passed so close to us that we had a full view of it. Like the whales, which it appeared to be following, it swam slowly, passing the *Swan* at a distance of 80 yards. I can therefore testify that its length was at least 40 feet; and in bulk it seemed to be nearly equal to some of the whales. From the circumstances of its great size there can be no doubt that this was a specimen of *Rhinodon typicus*, or the great Pacific basking shark.

Another even more indefinite reference deserves brief mention only here. George Bennett, in 1831 saw two large sharks which he described as follows:[8]

On the 18th of March, 1831, during my former voyage, in latitude 44° 55′ north, and long. 25° 10′ west; in the evening, two sharks of a very large size were seen at a short distance from the ship. A high dorsal fin, projecting from the water, was at first only discernible, and had a resemblance to a rock. It was at first stationary, but soon began to move steadily along, and then occasionally the tail could be seen partially above the water. I know not to what species to refer it; one of the crew on board, who had been in a whaler, said that it was what they named a "bone shark," which is seen in numbers alongside the ships when they are cutting up a whale. He said, also, that he had seen them as large as a *twenty-barrel whale;* that "the mouth resembled the gills of a fish, and they are spotted over the back." Whether the latter part of this account accorded with the actual appearance of the fish, I was not sufficiently near to ascertain, but it appeared correct with respect to its large size.

This fish was seen in the North Atlantic near the Azores, but it is not clear that it was *Rhineodon*. However, the account seems of sufficient interest to warrant its inclusion here. If this fish was the whale shark, then we must note three occurrences in the Atlantic, this being the first.

One of the common haunts of this greatest of fishes is around the island of Ceylon, but it is not unknown in the Bay of Bengal, where it has been recorded by Lloyd[9] in 1908. However, this is not its first record for these waters, for in the year 1835 one W. Foley[10] had given the following vivid account of his experiences. We will let him tell his story in his own words.

On my voyage to Madras (in May last), I saw a most extraordinary fish, and one which had never before been seen by any seaman on board, although some of the officers and crew had been employed in the whale fishery. It was of the size of a whale but differing from that animal in shape; spotted like a leopard in very beautiful manner; it came close under the stern of the ship, during a calm, and we had a magnificent opportunity for viewing it; it had a very large dorsal fin, which it moved about with great rapidity when made angry in consequence of the large stones which we threw down upon it rashly, for it possessed sufficient strength to have broken the rudder and stove in the stern of the ship. Several large fish (seemingly Dog-fish), about a cubit in length and upwards, were gambolling about the monster, entering its mouth at pleasure and returning to the water again. The following will give you some idea of its shape. The mouth very large, dorsal fin black or dark brown, tail also; body covered with brown spots like a leopard, head lizard-shape.

This description leaves no doubt that this was a *Rhineodon,* and to one acquainted with their habits it is equally plain that the "dog-fish" were remoras or echeneises. Chierchia[11] (1884) found several remoras in the mouth of his specimen taken in the Bay of Panama. Others have noted the same fact. Foley's mistake is, however, perfectly excusable. Numerous other writers on sharks and remoras have mistaken these later for young sharks. The present writer was inclined to scoff at such errors, until in the clear waters around Key West, he made a similar mistake in the summer of 1913.

[8] Bennett, George, "Wanderings in New South Wales, Batavia, Pedir Coast, Singapore and China," London, 1834, Vol. II., p. 267.

[9] Lloyd, R. E., "The Occurrence of *Rhinodon typicus* at the Head of the Bay of Bengal," Records Indian Museum, 1908, Vol. II., p. 306.

[10] Foley, W., "An Unusual Sea Monster in the Bay [of Bengal]," *Journal Asiatic Society of Bengal,* 1835, Vol. 4, pp. 62–63.

[11] Chierchia, G., "The Voyage of the *Vettor Pisani,*" *Nature,* 1884, Vol. 30, p. 365.

In 1901, Kishinouye of the Imperial Fisheries Bureau, Tokyo, Japan, published an interesting description with a crude figure of a *Rhineodon* taken in Japan which he thought to be a new species and which he named *pentalineatus*. Apparently this paper was reproduced in Japanese as follows: "On Yasurizame (*Rhinodon pentalineatus*)," etc., *Dobuts. Zasshi*, Tokyo, 1903, Vol. 15, 41–44. This journal I have not been able to locate in America, and my letters to Mr. Kishinouye have seemingly gone astray, but the conjecture expressed above seems reasonable.

Our next and last reference is to the occurrence of this fish in the Philippines, where however, it is not entirely unknown since Dr. H. M. Smith,[12] the present U. S. Commissioner of Fisheries, has put on record (1911) an 18-foot specimen taken at Negros Occidental in 1910. Again Dr. David Starr Jordan[13] in 1915 recorded the capture of a 20-foot specimen at the island of Zebu in March of that year. However this last reference in question dates back to 1835 when one Captain H. Piddington published in the *Journal of the Asiatic Society of Bengal* a "Notice of an Extraordinary Fish." His account is so circumstantial and so fascinatingly interesting that it seems best to quote him verbatim.

In December, 1816, I commanded a small Spanish brig, and was lying at anchor in the Bay of Mariveles, at the entrance of the Bay of Manilla. One day, about noon, hearing a confusion upon deck, I ran up, and looking over the side, thought, from what I saw, that the vessel had parted [her chain] and was drifting over a bank of white sand and coral, *with large black spots*. I called out to let go another anchor, but my people, Manilla men, all said, "No Sir; it's only the *chacon!*" and upon running up the rigging, I saw indeed that I had mistaken the motion of the spotted back of an enormous fish passing under the vessel, for the vessel itself driving over a bank! My boatswain (*contramestre*), a Cadiz man, with great foolhardiness jumped into the boat with four men, and actually succeeded in harpooning the fish with the common dolphin-harpoon, or grains, as they are usually called, to which he made fast the deep-sea line; but they were towed at such a fearful rate out to sea, that they were glad to cut from it immediately.

From the view I had of the fish, and the time it took to pass slowly under the vessel, I should suppose it not less than 70 or 80 feet in length. Its breadth was very great in proportion, perhaps not less than 30 feet. The back was so spotted, that, had it been at rest, it must have been taken for a coral shoal, the appearance of which is familiar to seamen. I did not distinguish the head or fins well, from being rather short-sighted, and there being some confusion on board.

As my people seemed to look upon "the *chacon*," as they called it, almost in the light of an old acquaintance, which it was to many of them who had served in the Spanish gun-boat service, I made many inquiries of them, of which the following is the result.

"1. That there were formerly two of these monsters, and that they lived (*teñiam su casa*) in a cluster of rocks, called Los Puercos, at the southwest entrance of the bay of Mariveles; but that, about ten or fifteen years before this time, or say in 1800, one was driven on shore, and died close to the village in the bay; the inhabitants of which were compelled by the stink to abandon their houses for a time.

"2. That the remaining one frequented the bay of Mariveles and that of Manilla, and it was supposed that it often attacked and destroyed small fishing boats, which, never appeared after going out to fish, though no bad weather had occurred. This last account I afterwards found singularly corroborated.

"3. That it was considered as dangerous by the Spanish gunboats; that they always when there kept a swivel loaded, the report of which, they said, drove it away. My principal informant was a man, employed as pilot for the ports in the Philippine Islands, whither I was bound, who had passed his whole life in the gun-boats. He said that one instance of its voracity occurred when he was present. A man, who was pushed overboard in the hurry to look at the monster, being instantly swallowed by it.

"4. The native fishermen of the Bay of Manilla quite corroborate this account, and speak of the monster with great terror."

About 1820 or 1821, an American ship's boat,

[12] Smith, H. M., "Note on the Occurrence of the Whale Shark, *Rhinodon typicus*, in the Philippine Islands," *Proceedings Biological Society of Washington*, 1911, Vol. 24, p. 97.

[13] Jordan, David Starr, SCIENCE, 1915, March 26, p. 463.

with an officer and a few men, was proceeding from Manilla to Cavite; but meeting with a severe squall and thick weather, they were driven nearly into the middle of the bay. They were pulling in what they thought the best direction, when on a sudden the sailors all dropped their oars. But the mate, who was steering, looking astern of the boat, saw the open jaws of a huge fish almost over him. Having nothing at hand, he threw the boat's tiller into the mouth of the fish, shouting as loud as possible; when, the jaws closing with a tremendous crash, the whole fish, which they described to be more like a *spotted* whale than anything else, dived beneath the boat, and was seen no more. I do not now recollect the names of the ship, or of the captain, but I thought the circumstance of the spotted appearance a remarkable proof that the story is not an invention. "We do not like to tell it," said the American captain, "for fear of being laughed at; but my officer is quite trustworthy, and we have learned from the fishermen too, that there is some strange species of large fish highly dangerous to their boats."

Like the American officer, I fear almost being laughed at, were it not that, could we collect more facts relative to these strange monsters, they might perhaps at least explain some of the "coral spots" so often mentioned in our charts: independent of its being a matter of great interest to the naturalist. I therefore add here a vague notice of monstrous spotted fish, which are known to the Moluccas.

These are called by the fishermen of Ternate, Celebes, etc., a "*Ikon Bintang*" (or star-fish) from the bright light which they occasion, and by which they are recognized at great depths at night, in calm weather. The Malay fishermen describe them too as spotted, as large as a whale and highly destructive to nets; which they instantly take up when they see the fish, if they can get time to do so; for it is known to destroy boats, and whole lines of nets and fishing stakes, if it once became entangled amongst them, to the ruin of the poor fishermen. I had the same account corroborated in the Sooloo Islands, both by the Malay and Chinese fishermen; as also at Zebu, in the Philippine Islands. At Sooloo, I was shown large quantities of the skin of a spotted fish, cut into pieces and dried, for sale to the Chinese Junks, which my people said was the skin of young "*chacons*"—"*Piro no son estos como chacon de alla, Senor.*" "But these are not like our chacon yonder, Sir," was always added. This skin I should have called that of a spotted shark [of the ordinary kind like the tiger shark]; the tubercles were excessively coarse and rough.

It seems thus certain, that some immense *spotted* fish, of highly destructive tendencies . . . exists in the Seas of the Eastern Archipelago.[14]

One hardly knows what to make of this. Andrew Smith (1829 and 1849),[15] the first discoverer of the fish, says "Oesophagus rather narrow," while all the writers about *Rhineodon* who have known the fish at first hand—notably Wright[16] whose opportunities for study of it were greater than all others—have commented on its mild disposition. On the other hand Dr. Jordan (1915) records that the Zamboanga, Philippine Islands, specimen had in its stomach a number of shoes, leggings, leather belts, etc. The structure of its gills, however, plainly shows that it is a whale not merely in size but in manner of feeding. Hence these stomach contents are, as Dr. Jordan notes, incongruous and inexplicable in the light of its gill structures and small oesophagus.

The latter part of Piddington's account is no less valuable than the first since it ties in well with other accounts of the occurrence of *Rhineodon* in the waters of the East Indies, particular in the Celebes. Thus Weber (1902, 1913)[17] states that he saw several in the strait between Buton and Muna in this archipelago. While in the Java Sea, van Kampen (1908)[18] dissected one at Batavia and later obtained a

[14] Piddington, H., "Notice of an Extraordinary Fish," *Journal Asiatic Society of Bengal*, 1835, Vol. 4, pp. 218–222.

[15] Smith, Andrew, "Contributions to the Natural History of South Africa," *Zoological Journal*, 1829, No. 16, p. 643. (*Do.*) Pisces, in Illustrations of the Zoology of South Africa, plate 26 and description, London, 1849.

[16] Wright, E. P., "Six Months at the Seychelles," *Spicilegia Biologica*, Pt. I., pp. 64–65. Dublin.

[17] Weber, Max, "Siboga-Expeditie," Vol. I., Introduction et Description de l'Expedition, p. 88. Leiden, 1902; Vol. 57, "Die Fische der Siboga-Expedition," p. 584. Leiden, 1913.

[18] Van Kampen, P. N., "Die Nahrung von *Rhinodon typicus* Smith," (In Kurze notizen

photograph of still another which was taken on the north coast of Java. Pertinent here are the words with which I closed the section entitled "Habitat" in my larger paper previously referred to: "its special habitat seems to be in the Indian Ocean and the waters contiguous thereto."

E. W. GUDGER

THE BALTIMORE MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE American Association for the Advancement of Science and the national scientific societies named below will meet in Baltimore, during convocation week, beginning on Thursday, December 26, 1918:

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—President, Professor John M. Coulter, University of Chicago; retiring president, Professor Theodore W. Richards, Harvard University; permanent secretary, Dr. L. O. Howard, Smithsonian Institution, Washington, D. C.; general secretary, O. E. Jennings, Carnegie Museum, Pittsburgh, Pa.

Section A—Mathematics and Astronomy.—Vice-president, Professor George D. Birkhoff, Harvard University; secretary, F. R. Moulton, University of Chicago, Chicago, Ill.

Section B—Physics.—Vice-president, Professor Gordon F. Hull, Dartmouth College; secretary, Professor George W. Stewart, University of Iowa, Iowa City, Ia.

Section C—Chemistry.—Vice-president, Professor Alexander Smith, Columbia University; secretary, Professor Arthur A. Blanchard, Massachusetts Institute of Technology, Cambridge, Mass.

Section D—Mechanical Science and Engineering.—Vice-president, Professor Ira N. Hollis, Worcester Polytechnic Institute; secretary, Professor F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

Section E—Geology and Geography.—Vice-president, Dr. David White, U. S. Geological Survey; secretary, Rollin T. Chamberlin, University of Chicago, Chicago, Ill.

Section F—Zoology.—Vice-president, Professor William Patten, Dartmouth College; secretary, Professor W. C. Allee, Lake Forest College, Lake Forest, Ill.

Section G—Botany.—Vice-president, Dr. A. F. Blakeslee, Cold Spring Harbor, N. Y.; secretary, Dr. Mel T. Cook, Agricultural Experiment Station, New Brunswick, N. J.

Section H—Anthropology and Psychology.—Vice-president, Aleš Hrdlička, U. S. National Museum; secretary, Lieutenant Colonel E. K. Strong, Jr., Room 528 State, War and Navy Building, Washington, D. C.

Section I—Social and Economic Science.—Vice-president, John Barrett, Pan-American Union; secretary, Seymour C. Loomis, 69 Church Street, New Haven, Conn.

Section K—Physiology and Experimental Medicine.—Vice-president, Professor Frederic S. Lee, Columbia University; secretary, Professor J. A. Goldfarb, College of the City of New York, New York City.

Section L—Education.—Vice-president, Dr. Stuart A. Courtis, Detroit Department of Educational Research; secretary, Major Bird T. Baldwin, Walter Reed General Hospital, Washington, D. C.

Section M—Agriculture.—Vice-president, Professor Henry P. Armsby, State College, Pa.; secretary, Dr. E. W. Allen, U. S. Department of Agriculture, Washington, D. C.

AMERICAN FEDERATION OF TEACHERS OF THE MATHEMATICAL AND THE NATURAL SCIENCES.—Will hold Council meeting at 10 A.M., December 27. Secretary, William A. Hedrick, Central High School, Washington, D. C.

AMERICAN PHYSICAL SOCIETY.—Will hold joint sessions with Section B, A. A. A. S., from December 26 to 28. President, H. A. Bumstead; secretary; Dayton C. Miller, Case School of Applied Science, Cleveland, Ohio.

OPTICAL SOCIETY OF AMERICA.—Will meet on Friday, December 27. President, F. E. Wright; secretary, P. G. Nutting, Westinghouse Research Laboratory, East Pittsburgh, Pa.

SOCIETY FOR PROMOTION OF ENGINEERING EDUCATION.—December 26–28. President, John F. Hayford; secretary, F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

GEOLOGICAL SOCIETY OF AMERICA.—December 27 and 28. Joint meeting with Association of American Geographers, afternoon of December 28; joint meeting with Section E, A. A. A. S., on night of December 28. President, Whitman Cross, U. S. Geological Survey; secretary, E. O. Hovey, American Museum of Natural History, New York, N. Y.

über Fische das Java-Meeres), *Natuurkundig Tijdschrift voor Nederlandsch Indie*, 1908, deel 67, p. 124.

Association of American Geographers.—December 27 and 28. Joint meeting with Geological Society of America on afternoon of December 28. President, Nevin M. Fenneman, New York City; secretary, O. L. Fassig (absent).

Paleontological Society of America.—December 28. President, F. H. Knowlton, U. S. National Museum; secretary, R. S. Bassler, U. S. National Museum, Washington, D. C.

American Society of Naturalists.—December 28. Annual dinner, Saturday night. Vice-president, Guy N. Collins (in the chair); secretary, Bradley M. Davis, Statistical Division, U. S. Food Administration, Washington, D. C.

American Society of Zoologists.—December 26 to 28. Joint session with American Society of Naturalists Saturday morning, December 28. President, George Lefevre, University of Missouri; acting secretary, W. C. Allee, Lake Forest College, Lake Forest, Ill.

American Association of Economic Entomologists.—December 26 and 27. President, E. D. Ball; secretary, Albert F. Burgess, Gipsy Moth Laboratory, Melrose Highlands, Mass.

Botanical Society of America.—December 26 to 28. Joint session with Section G, A. A. A. S., and American Phytopathological Society on Thursday afternoon, December 26. Joint sessions with American Phytopathological Society on Friday and Saturday, December 27 and 28. Joint session with Ecological Society of America on Saturday morning, December 28. President, William Trelease, University of Illinois; secretary, J. R. Schramm, Cornell University, Ithaca, N. Y.

American Phytopathological Society.—December 23 to 28. Joint meetings with Botanical Society of America on Friday and Saturday, December 27 and 28. Tenth anniversary dinner, 6.30 P.M., Wednesday, December 25. President, E. M. Freeman; secretary, C. L. Shear, U. S. Department of Agriculture, Washington, D. C.

Ecological Society of America.—December 26 to 28. Joint session with American Society of Zoologists, Friday morning, December 27. Joint session with Botanical Society of America on Saturday morning, December 28. President, Henry C. Cowles, University of Chicago; secretary, Forrest Shreve, Desert Laboratory, Tucson, Arizona.

American Anthropological Association.—December 26 to 28. Joint session with Section H, A. A. A. S., on December 26, and joint session with American Folk-Lore Society on December 27. President, A. L. Kroeber, Affiliated Medical Colleges, San Francisco; acting secretary, Bruce W. Merwin, University of Pennsylvania Museum, Philadelphia, Pa.

American Psychological Association.—December 27 and 28. Will hold joint sessions with Sections H and L. Secretary, Herbert S. Langfield, Harvard University, Cambridge, Mass.

American Folk-Lore Society.—December 27. Will hold joint session with American Anthropological Association. President, C. Marius Barbeau; secretary, Charles Peabody, Harvard University, Cambridge, Mass.

American Metric Association.—December 27 to 28. The session of Saturday will be held at the Bureau of Standards, Washington. President, George F. Kunz; secretary, Howard Richards, Jr., 156 Fifth Avenue, New York, N. Y.

Society of American Bacteriologists.—Will meet on Friday and Saturday, December 27 and 28. President, R. C. Buchanan, University of Wisconsin; secretary, A. Parker Hitchens, Army Medical School, 462 Louisiana Avenue, Washington, D. C.

American Society for Horticultural Science.—December 27 and 28. President, C. A. McCue; secretary, C. P. Close, College Park, Md.

Society of American Foresters.—December 27 and 28. President, Filibert Roth, U. S. Department of Agriculture; secretary, E. R. Hodson, U. S. Forest Service, Washington, D. C.

School Garden Association of America.—December 23 and 24. President, J. H. Francis; vice-president and acting secretary, V. E. Kilpatrick, 124 W. 30th Street, New York, N. Y.

American Association of University Professors.—December 28. President, Professor John M. Coulter, University of Chicago; secretary, Dr. H. W. Tyler, Massachusetts Institute of Technology, Boston, Mass.

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